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Altitudinal Variation in an African Grass Warbler

(*Cisticola hunteri* Shelley)

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In 1948 Mr. Walther Buchen of Chicago donated to the Chicago Natural History Museum a small collection of birds from Mt. Kenya, Kenya Colony, collected by Dr. J. G. Williams. In this collection was a specimen of the grass warbler, *Cisticola hunteri* Shelley, from high on Mt. Kenya, which indicated that considerably more altitudinal variation existed on that mountain than had been recognized.

Through the kindness of Dr. J. P. Chapin and the American Museum of Natural History, and Dr. Herbert Friedmann and the United States National Museum, I was able to borrow pertinent material for comparison with the present specimen and the specimens of this species in the Chicago Natural History Museum from the Jackson Collection. Dr. Chapin also provided me with invaluable critical comments.

Cisticola hunteri ranges over the whole of the Kenya highlands, including Mt. Elgon above 9,000 feet, and though separated by an uninhabited gap of some 120 miles of unsuitable ground, also in isolated areas in Tanganyika Territory, on Mt. Kilimanjaro, Mt. Meru, Loliondo, Ketumbeine, Ngorongoro, Oldeani and Mbagai crater, all above about 6500 feet (Lynes, 1930, p. 336 and Moreau and Moreau, 1939, p. 10).

There is considerable geographical variation in this species. Lynes has described some of it and additional variation is evident in present material. Despite the fragmented character of the range of *C. hunteri* there is little horizontal variation; vertical (i.e., altitudinal variation) is more pronounced. Lynes divided the species into three races, and three names seem enough to use in discussing the variation, but the ranges as outlined by Lynes group together unlike populations, separate similar appearing populations, and give the impression that Lynes considered horizontal variation more important than altitudinal variation.

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ALTITUDINAL VARIATION

Mt. Kilimanjaro. Lynes (1930, p. 336ff; 1939, in Moreau p. 9, 10) and Moreau (1944, p. 50-51) have amply documented the color cline which exists here, grading from the pale birds at low altitudes to much darker birds at highest altitudes. The band of forest does not act as a barrier to interrupt the cline. From the following measurements of material at hand there is little increase in size with increased altitude:

<i>Altitude</i>	<i>Wing, males</i>	<i>Wing, females</i>
12,000 feet	63	58
10,000 feet	61,62,63,63	
9,000 feet	63	58
8,000 feet	63	
7,000 feet	60	
6,000 feet	62	
lower altitudes*	60,62	58,58

Mt. Elgon. Lynes (1930, p. 344) has set forth the variation. Apparently a cline also exists here: a pale patterned bird predominating at low altitudes; a darker, unpatterned bird at high altitudes. At 9,000 feet, the lower limit of the species on Elgon, the average bird is pale and patterned; from 9,000 to _____ 12,000 feet the birds are mostly intermediate. _____ a bird of one type may be found alongside one of the other. The majority of the nearly immaculate birds come from the uppermost heights, from about 12,000 feet up to the summit, 14,100 feet, and inside the summit crater.

Mt. Kenya. When Lynes monographed this genus he listed but a single specimen from Mt. Kenya and intimated that slight altitudinal variation existed (1930, p. 336-344). Meinertzhagen (1937, p. 749) in his study of the birds of Mt. Kenya made no mention of altitudinal variation in *C. hunteri*, and Moreau (1944, p. 50, 51 and 1945, p. 80, 89) says there is no appreciable difference between high and low altitude *C. hunteri* on Mt. Kenya.

The single specimen Lynes lists from Mt. Kenya is the type of *neumanni*

taken at 10,000 feet. Lynes (1930, p. 651) judged it to be an "ad. m in good (Perennial) dress, wing 63, tail 69." Dr. J. P. Chapin has examined the type now in New York and writes me it is an immature bird, unsexed by the collector, and he is surprised Lynes judged it an adult.

The specimen of *Cisticola hunteri* collected by Williams' on Mt. Kenya was an adult female taken at 12,000 feet on August 12, 1948, that is much darker than specimens of the subspecies *C. h. prinioides* which is said to range

over all Mt. Kenya and the surrounding highlands. Lacking adequate comparative material, I sent the bird to Dr. Chapin in New York. Mt. Kenya material in the American Museum includes the type of *neumanni*, three adults collected at 10,000 feet on Mt. Kenya by Chapin, Sage and Mathews, and an immature male from 8,600 feet on the east slope of Mt. Kenya. Dr. Chapin kindly examined these birds and compared the Buchen specimen from the Chicago Natural History Museum with them. Dr. Chapin writes me that the bird from 12,000 feet in our collection, compared with the three adults in New York collected at 10,000 feet, "is very well matched in its dark coloration, above and below." Chapin also writes me that the type of *neumanni* is "markedly lighter and more brownish, simply because it is an immature bird." An immature male collected at 8,600 feet on the east slope of Mt. Kenya by the Chapin party, he writes, is rather like the type of *neumanni*, perhaps just a shade lighter.

Of the two specimens from Mt. Kenya before me, one came from 10,000 feet (taken in 1926) and the other 12,000 feet (taken in 1948). The former bird is slightly paler than the latter, possibly an expression of conditions at higher altitudes, corresponding with what occurs on Mt. Kilimanjaro, and it is also considerably more brownish tinged, especially on the upperparts. However, the skin is 22 years older than the one from 12,000 feet and this difference may well be due to foxing. The Mt. Kenya birds are nearly as heavily patterned on the upperparts as are Mt. Kilimanjaro birds.

These two Mt. Kenya specimens, compared with 11 birds from various parts of the range of *C. h. prinioides* in the highlands of Kenya Colony, are much darker, more blackish above; and are much darker, and more greyish, largely lacking in brownish or buffy tinge, on the underparts. There is no overlap in these characters. The difference is as great as, and very similar to, the difference between high altitude and low altitude birds on Mt. Kilimanjaro. There is little evidence of altitudinal variation in size shown by the following measurements:

<i>Altitude</i>	<i>Wing, males</i>	<i>Wing, females</i>
12,000 feet (Mt. Kenya)		60
10,000 feet (Mt. Kenya)		61
6,000-8,500 feet (Kenya highlands)	58,58,61,62,63,66,67	56,60,62,64

HORIZONTAL VARIATION

On Mt. Kilimanjaro only birds from above 11,000 feet have the full depth of color attained on that mountain. Of these I have two specimens collected at 12,000 feet in 1920. Compared with my two Mt. Kenya birds the two Mt. Kilimanjaro birds fall between them in depth of color; slightly

lighter than the one from 12,000 feet, and slightly darker than the one from 10,000 feet. Both Mt. Kilimanjaro birds are rather brownish tinged, both on the upper and underparts, as is the 1926 Mt. Kenya bird from 10,000 feet, and rather different in this from the one from 12,000 feet on Mt. Kenya. However, the brownness I attribute to foxing of old skins, and on the material available I would hesitate to separate them. It seems inevitable that high altitude Mt. Kenya birds be grouped with high altitude Kilimanjaro birds as *Cisticola hunteri hunteri*.

Lower Kilimanjaro and Kenya highlands birds. Lynes wrote (in Moreau, 1939, p. 9) that "although on Kilimanjaro the lower-level aggregates are certainly of paler coloration than those of the upper levels, the differences are those of lighter tints of the same cold grey *color-tone* rather than those which are matched by the warmer, browner *hues* of the *prinioides* matrix." I have for comparison with the above 11 specimens of *prinioides* from Kenya Colony, eight specimens from low altitudes (down to 5,000 feet) from Mt. Kilimanjaro. These low altitude Kilimanjaro birds average darker than Kenya Colony *prinioides* but the difference is slight, and some specimens are not distinguishable. They are much closer to Kenya Colony *prinioides* and less separable from them than the much more different high altitude *C. h. hunteri* of Mt. Kilimanjaro and Mt. Kenya. I have a few intermediate type birds from intermediate altitudes on Mt. Kilimanjaro but this aspect of the problem is already amply documented (especially Moreau, 1944). It seems advisable to continue to call lower altitude birds on Kilimanjaro *C. h. prinioides* as Lynes did in 1930, despite his 1939 decision.

Lower Mt. Elgon and Kenya highlands birds. Lynes (1930, p. 244) writes that at 9,000 feet on Mt. Elgon the "average bird" is very like *C. h. prinioides*. Would it not seem logical to call it *prinioides*?

The population of upper Mt. Elgon birds is said to differ from the population from the high altitudes of Mt. Kilimanjaro (and Mt. Kenya), which it most resembles, in the slightly less somber color and the less patterned upperparts (Lynes, 1930, p. 343). This is one of the three separate clines arising on separate mountains from a stock of similar appearance in each case. It differs sufficiently from the extremes of the other two clines to be named (*C. h. masaba*).

There are other isolated populations: the Mt. Meru birds (I have seen no specimens) which exist at altitudes equal to those on Mt. Kilimanjaro but have not evolved darker highland representatives, due perhaps to the very small area of the mountain at high altitudes (Moreau, 1939, p. 1, 10). These have been included in *C. h. prinioides* without comment. The birds of the various populations in Northern Tanganyika on Loliondo, Ketumbeine,

Ngorongoro, Oldeani and Mbagai crater, all above about 6,500 feet, apparently represent a series of isolated populations. They are included in *prinioides* by Moreau (1939, p. 10). I have a single specimen from Ngorongoro, about 6,500 feet (Kellogg, Nov. 25, 1932). It is slightly duller than average Kenya Colony *C. b. prinioides* and agrees well with low altitude Mt. Kilimanjaro birds. If all Mt. Kilimanjaro birds were to be grouped together as separate from Kenya Colony *prinioides*, this Ngorongoro bird would certainly be grouped with those from Mt. Kilimanjaro.

SUMMARY OF VARIATION

Throughout the lower altitudes of the range occupied by the species, the populations—though existing as separate scattered populations—are very similar. On three different mountains——Mt. Elgon, Mt. Kenya (probably), and Mt. Kilimanjaro—clines exist, with the birds at the extreme high altitudes different in appearance from the rest of the populations. Two of the high altitude end products of these clines are very similar to each other (those of Mt. Kenya and Mt. Kilimanjaro); the third differs in appearance.

PROBLEMS OF CLASSIFICATION

The variation in *Cisticola hunteri* poses peculiar problems in classification. Lynes concluded that if some of an isolated group of populations differed from the rest of the species, all of that isolated group of populations should be called one subspecies; witness his including both *C. b. hunteri-like* and *C. b. prinioides-like* birds on Mt. Kilimanjaro in *C. b. hunteri*. However, I think a different viewpoint is preferable.

It seems to me that the taxonomist's first task in the study of variation in a species is to map geographically the distribution of the varying characters. If the ranges of bird populations with certain characters or groups of characters of subspecific value form simple geographic patterns, the next step is to apply different subspecific names to the populations making up each geographical pattern. If the characters form a highly complex pattern, it is inadvisable to apply any subspecific names.

Subspecific names as well as indicating similarities in appearance should also indicate relationships and modes of evolution.

The patterns of distribution of characters in *Cisticola hunteri* are simple enough so that three subspecific names are useful. The question of the relationships of some populations require elucidation. In *Cisticola hunteri* the birds of the Kenya highlands (except upper Mt. Kenya), the lower inhabited altitudes on Mt. Elgon, lower Kilimanjaro, and the other isolated mountains

in northern Tanganyika Territory are all very similar in appearance and, despite their present fragmented distribution, presumably are all closely related and represent a common stock. They should all be grouped under one subspecific name, *C. h. prinioides*.

The higher altitude birds on Mt. Elgon present little of a problem in this connection. They are the high altitude end product of a cline with differences of subspecific rank when compared with *prinioides* from lower altitudes on Mt. Elgon and elsewhere, and with high altitude birds from Mt. Kenya and Mt. Kilimanjaro. They can be separated under the name *C. h. masaba*."

The birds from high altitudes on Mt. Kenya and Mt. Kilimanjaro present a difficulty. Though without observable differences of taxonomic rank, it is probable that each evolved independently from different parts of a common lowland stock: the high altitude Mt. Kenya birds from Kenya highlands *prinioides*, the high altitude Kilimanjaro birds from lower altitude Kilimanjaro *prinioides*. Similarity in environmental factors and selective pressure acting on separate offshoots of the common stock have resulted in identical results, as far as observable characters are concerned. From one point of view (historical zoogeography) they are not closely related, since one did not arise from the other; from another point of view (ecological zoogeography) the ancestral form being the same, and the factors in their evolution being very similar, they are closely related. The weight of this argument is better appreciated after considering another example. The continent-wide ranging bald eagle (*Haliaeetus leucocephalus*) of North America exhibits a line: increase in size with increase in latitude. The northern transcontinental belt of birds are known as one race, the southern as another. Is it not just as likely that rather than the large northern race originating at one point and spreading from it over the whole northern range, the evolution into a northern form occurred simultaneously over a wide front, various parts of the northern population being derived from, and most closely related to, the nearest populations to the south? If this is accepted, that subspeciation proceeds on a broad front, there seems no great difficulty in considering the two isolated similar-appearing forms on Mt. Kenya and Mt. Kilimanjaro as the same subspecies, *C. hunteri hunteri*.

*Further knowledge may affect the treatment in regard to *Cisticola chubbi*, which occurs on Mt. Elgon below the range of *C. hunteri*. The two species may be found to be conspecific. A further possible complication is that the type of *masaba*, exhibiting the characters of *masaba*, is labeled as coming from an altitude where the population is *prinioides*. However, field work on this problem is advisable before attempting to change names.

PRESENT ARRANGEMENT OF RACES

Lynes' arrangement (1930, p. 336-34⁴, amended in Moreau and Moreau, 1939, p. 9, 10) is as follows:

1. *Cisticola hunteri hunteri* Shelley, all Kilimanjaro from its (habitable) top to its base.
2. *Cisticola hunteri prinioides* Neumann, the whole of the Kenya highlands, including Mt. Kenya but not Mt. Elgon; also on Mt. Meru, nearly to the summit, c.15,000 feet; also on Loliondo, Ketumbeine, Ngorongoro, Oldeani and Mbagai crater, all above about 6,500 feet in northern Tanganyika Territory.
3. *Cisticola hunteri masaba* Lynes, Mt. Elgon from 9,000 feet to the summit (replaced by another species, *C. chubbi*, at lower altitudes).

This arrangement has the advantage of giving sharply defined, easily characterized ranges. However, from Lynes' clear account of the specimens he examined, plus the additional new information on Mt. Kenya birds, the following arrangement is thought to portray more truly the facts of variation.

PROPOSED ARRANGEMENT OF RACES

1. *Cisticola hunteri hunteri* Shelley. High altitudes on Mt. Kilimanjaro; intergrading with the lower altitude *C. h. prinioides* below 11,000 feet; also on Mt. Kenya* at high altitudes, down at least to 10,000 feet) probably intergrading with *C. h. prinioides* at lower altitudes (the species inhabits glades all through the forest belt. Moreau, 1945, p. 80).
2. *Cisticola hunteri prinioides* Neumann. The highlands of Kenya Colony (except high altitudes on Mt. Kenya where its place is taken by *C. h. hunteri* with which it probably intergrades there); also low altitudes on Mt. Kilimanjaro (intergrading at higher altitudes with *C. h. hunteri* with which it forms a cline there); also Mt. Meru; also on Loliondo, Ketumbeine, Ngorongoro, Oldeani and Mbagai crater, all above about 6,500 feet in Northern Tanganyika Territory; also between 9,000 and 12,000 feet on Mt. Elgon (intergrading with the higher altitude *C. h. masaba*, and replaced below 9,000 feet by the closely related *C. chubbi*).
3. *Cisticola hunteri masabat* - Lynes. Higher altitudes on Mt. Elgon (intergrading at lower altitudes with *C. h. prinioides* with which it apparently forms a cline there).

*If Mt. Kenya birds should prove different from Mt. Kilimanjaro birds the name *neumanni* is available.

The type locality of *masaba* is at 9,000 feet, where the average bird is *prinioides* but the type is *masaba* in character. (Lynes, 1930, p. 344).

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